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Mr. W. C. Mills, curator of the museum of the Ohio State Archaeological and Historical Society, has prepared a report of the field work of the society for the year ending May 31, 1898, that has been published in Vol. VIII of the *Annual Publications of the Society*. The work consisted in the exploration of mounds and the addition of new data to the state archaeological map. The explorations seem to have revealed little that is new, though the discovery of post molds in a mound in Knox County is worthy of note. These molds were in the form of a square twenty-seven feet on each side. In the center of the enclosure was a fire pit of yellow clay six feet in diameter. In another mound five headless skeletons were found promiscuously heaped together. This recalls the discovery made at the Turner Mounds, a number of years ago, of sixteen skulls that had been buried together.

In the *Bulletin of the American Museum of Natural History*, Vol. XIII, pp. 69-86, appears an article by Mr. A. L. Krøeber upon the "Symbolism of the Arapaho Indians." It is very concisely written, and illustrated with 138 figures representing the symbols most commonly employed. These range from a straight line (Fig. 24) to a silhouette of the human figure (Fig. 124). Mr. Krøeber concludes that the symbolic tendency prevails over the decorative in Arapaho art.

In the *American Anthropologist* (N. S.), Vol. II, No. 2, is published a paper by Dr. J. R. Swanton upon the "Morphology of the Chinook Verb" that should be of interest and value to students of the science of linguistics. It is an exhaustive study of the verb, prefaced by a general account of the other parts of speech in the Chinook language. This thesis was accepted at Harvard University as fulfilling the requirements for the degree of Doctor of Philosophy. F. R.

ZOÖLOGY.

A Zoögeographic Scheme for the Mid-Pacific.¹—Some time ago (*American Naturalist*, No. 396, p. 975, December, 1899) we called attention to C. Hedley's views on the former existence of an antarctic continent; now, a recent paper has come into our hands on a subject that is intimately connected with the question of the origin of the faunas of the Central Pacific Islands, Australia, and New Zealand.

¹ Hedley, Chas. *Proc. Linn. Soc. N. S. Wales* (1899), Pt. iii, July 26.

Hedley maintains that the faunas of Australia and the Pacific Islands—generally united into the Australian region—have developed under two completely different conditions. On the one side, the western, continental conditions prevailed, Australia proper being connected with New Guinea, and New Guinea, in turn, through the Solomon Islands, New Hebrides, and New Caledonia, with New Zealand, while the Fiji Islands formed another branch of this old continental mass, being connected with the New Hebrides and Solomon Islands.

On the other side, the eastern, we have the rest of the Pacific Islands, where oceanic conditions have always prevailed, the different islands of the Gilbert, Ellice, Samoan, Tonga groups, etc., never forming a continuous continent.

This fundamental difference finds its expression in the faunas of these two parts, in so far as in the western part a “harmonic” fauna (G. Baur) exists, that is to say, a fauna that is composed of the chief groups of animal life, without considerable gaps. In the eastern part, however, such gaps are very frequent and mark the fauna at once as a “disharmonic,” many important groups of animals being completely missing. In the western part a continuous migration over the whole extent of this continental mass was possible, thus favoring more even distribution of the land animals over the whole area, while in the eastern part the land fauna could only migrate by drift over the intervening parts of the ocean, which excludes at once a large number of animals.

In the *fauna of the western, or continental, part* we can distinguish three chief constituents: (1) an Australian-Autochthonian (Tate), or Eyrean (Spencer), which is restricted to Australia proper, and hardly passes beyond Queensland to the north; (2) the so-called Euronotian (Tate), or Bassian (Spencer), which is the most characteristic Australian element, and of antarctic origin; it entered Australia by the south, over Tasmania, and crossed Torres Strait into New Guinea, reaching its limit in the Solomon Islands; (3) the Torresian (Spencer) element. Its center lies in New Guinea, from whence it was connected with the Indo-Malaysian fauna. It sends off from New Guinea two branches, the one crossing Torres Strait southward and entering Queensland, the other one traversing New Britain, New Ireland, the Solomons, sending an offshoot to Fiji and another along the chain of the New Hebrides and New Caledonia, ultimately arriving at New Zealand.

In New Zealand the southern advance of the Torresian element

was met by a strong antarctic element, coming from the supposed antarctic continent. The latter may be traced up to New Guinea and is probably older than the other antarctic element that enters Australia from the south.

The *Polynesian fauna*, that of the *eastern, oceanic part*, has derived its population from two sources. The first way was from the Moluccas or the Philippine Islands through the Pelews and Carolines to the Marshalls, and thence down along the chain of archipelagoes to the Paumotu Islands; this is called the Micronesian route. The other way, the Melanesian route, started from the Fiji Islands, belonging to the Australian continental fauna, whence the respective animals crossed over by drift to the Tonga and Samoan groups. By this way Torresian, as well as antarctic elements, both being represented in the Fijis, have contributed to the Polynesian fauna, while by the first way only Indo-Malaysian (closely connected with the Torresian) elements could immigrate.

We cannot deny that this theory of the origin of the Pacific faunas has many points in favor of it; especially the explanation of the connection of the continental faunas of Australia, New Guinea, etc., to New Zealand seems very acceptable. On the other hand, Hedley's opinion of the oceanic nature of the Polynesian fauna cannot be accepted without comment. Indeed, there seems to be a sharp line, just where Hedley draws it, between Fiji on one side and the Tonga and Samoan groups on the other; but whether the "disharmonic" fauna of Polynesia is to be explained by, and is synonymous with, "oceanic origin" remains to be demonstrated. The terms "harmonic" and "disharmonic" — although they may be useful sometimes — are only of relative value; New Zealand, for instance, has decidedly a "disharmonic" fauna, but Hedley himself believes it to be of continental origin.

And, further, the theory of the oceanic origin of the Polynesian fauna is opposed to the views of some of the most prominent recent writers in *Zoögeography*. Hedley refers only to the opinion of G. Baur (as expressed in No. 31, 1897, of this journal), and, indeed, in one of the instances which he quotes (p. 412) Baur's argument derived from the distribution of *Pocillopora* and *Trapezia* is not very convincing. But there is another vigorous champion of the continental origin of the Polynesian fauna, namely, H. von Ihering, and his arguments are certainly worth discussing. Von Ihering traces the continental origin of the Polynesian fauna far back into the Mesozoic time and thus explains the "disharmonic" character of it;

the lack of certain groups of animals is apparently due to the fact that they did not exist at all at the time when there was a connection of these parts with others.

But we need further investigations on this subject, and it is not advisable to express at present a definite opinion on this topic. Hedley's paper gives one solution of the problem, and, indeed, his arguments are very important, and his theory may finally prove to be correct, at least to be the most probable.

A. E. O.

The Distribution of the Opilionidæ. — Dr. J. C. C. Loman¹ has published a synopsis of the facts known about the distribution of the Opilionidæ, illustrated by four maps. It is hardly necessary to discuss the paper in detail, as the author intended simply to give the facts, without giving an explanation of them. We should like, however, to call attention to certain features of the distribution of these animals which seem to furnish additional evidence in favor of von Ihering's theories.

It will be remembered that, according to von Ihering, South America is no zoögeographical unit, but consists of two separate centers of origin; the one is situated in its southern part and was connected at a certain time with the antarctic continent; this is called "Archiplata"; the other one comprises the northern parts of the present South America, and was connected, in Mesozoic times, with West Africa. This Mesozoic continental mass has been called by von Ihering by the name of "Archhelenis."

Now, according to Loman's map (Pl. XI, Fig. 2), the distribution of the Opilionid family, *Gonyleptoidæ* (expressed in green dots), is in South America and the West Indies on the one side, and in West Africa on the other, and it would seem impossible to explain it in any other way than by accepting von Ihering's Archhelenis theory.

The relations of the southern parts of the present continents to the antarctic continent supposed to have existed formerly are expressed in the distribution of another family of Opilionids, the *Triænonychoidæ*. As Loman's map (Pl. XI, Fig. 4) indicates (by red dots), this family has been found in South Africa, Madagascar, South Australia, the Fijis, and in Chili. This distribution corresponds closely to that of other antarctic animals.

A. E. O.

¹ Ueber die geographische Verbreitung der Opilioniden, *Zool. Jahrb.*, Abt. f. Syst., Bd. xiii (1900).